TASC Summary – Landfill Leachate at Bridgeton Landfill

Introduction

This fact sheet provides information on the collection, permitting, sampling, treatment and disposal of landfill leachate (liquid) from the Bridgeton Landfill.

What is landfill leachate?

It is the liquid that drains or "leaches" from a landfill. It varies widely in composition, depending on the age of the landfill and the type of waste. It usually contains dissolved and suspended (solid) material. Disposal of landfill leachate requires a permit; it can contain various regulated substances.

Leachate Collection

The Bridgeton Landfill (also called the Former Sanitary Landfill) has a leachate collection system. The system removes rainwater and groundwater that flow through the landfill as well as liquids from decomposing wastes in the landfill.

The system pumps leachate from several locations, including the perimeter of the landfill, gas extraction and interceptor wells, trenches, horizontal sumps and six leachate collection sumps (LCSs). The LCSs, which are located in the former quarry pits, extend down to near the base of the landfill (see Figure 1).

The Missouri Department of Natural Resources required that Bridgeton Landfill pump leachate from the LCSs at a rate that keeps the height of leachate in the landfill at no more than 30 feet above the quarry floor. About half of the LCSs were able to do so during the past year.[1] A subsurface smoldering event (a chemical reaction called pyrolysis, in which materials heat up and decompose) caused damage to some LCSs and/or the associated leachate monitoring devices. When too much leachate accumulates in the landfill, the potential for contamination to reach groundwater increases.

What is a sump?

A low space that collects liquids such as water or chemicals. A sump pump removes the liquid. A leachate riser on top of a sump pump provides access from the ground surface.

The 2006 West Lake Landfill Operable Unit 2 Feasibility Study reported that the landfill's leachate collection system collected, on average,

[1] The May 2015 Leachate Level Report (http://dnr.mo.gov/bridgeton/docs/leachatelevels050115.pdf) shows that the LCS-2D, LCS-5A and LCS-6B sumps maintained less than 30 feet of leachate over the past year, though there were no readings for LCS-2D since October 2014. Leachate levels were greater than 30 feet for LCS-1D, LCS-3D and LCS-4B. Leachate level readings for LCS-3D were only available since March 2015; the measuring device had melted and was unusable for preceding months. Likewise, LCS-4B was not active for most of the past year; only readings since March 2015 were reported.

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about 32.5 million gallons of leachate per year. The March 2014 Revised Interim Leachate Management Plan for Bridgeton Landfill reported that up to 240,000 gallons of leachate is generated daily. This translates to about 87.6 million gallons of leachate annually, almost three times the amount expected. The subsurface smoldering event is leading to greater volumes of leachate collection.

Leachate Discharge Permit

A permit from the Metropolitan St. Louis Sewer District (MSD) allows Bridgeton Landfill to discharge about 315,000 gallons of pretreated leachate by pipeline or truck each day. The leachate must be pretreated for MSD to accept it at one of its wastewater treatment plants. MSD's pretreatment requirements are different for piped and trucked leachate because MSD processes the two types of leachate differently.

Bridgetown Landfill's current discharge permit from MSD runs from September 2015 to August 2019. Pretreated leachate may be sent by pipe from the landfill to the Bissell Point, Coldwater Creek or Missouri River wastewater treatment plants. Bissell Point is currently the primary direct discharge location. Pretreated leachate may be delivered by truck to Bissell Point or other disposal locations as necessary.

Leachate Sampling

MSD requires that Bridgeton Landfill sample pretreated leachate piped to MSD facilities before it reaches the junction manhole to the pump stations.

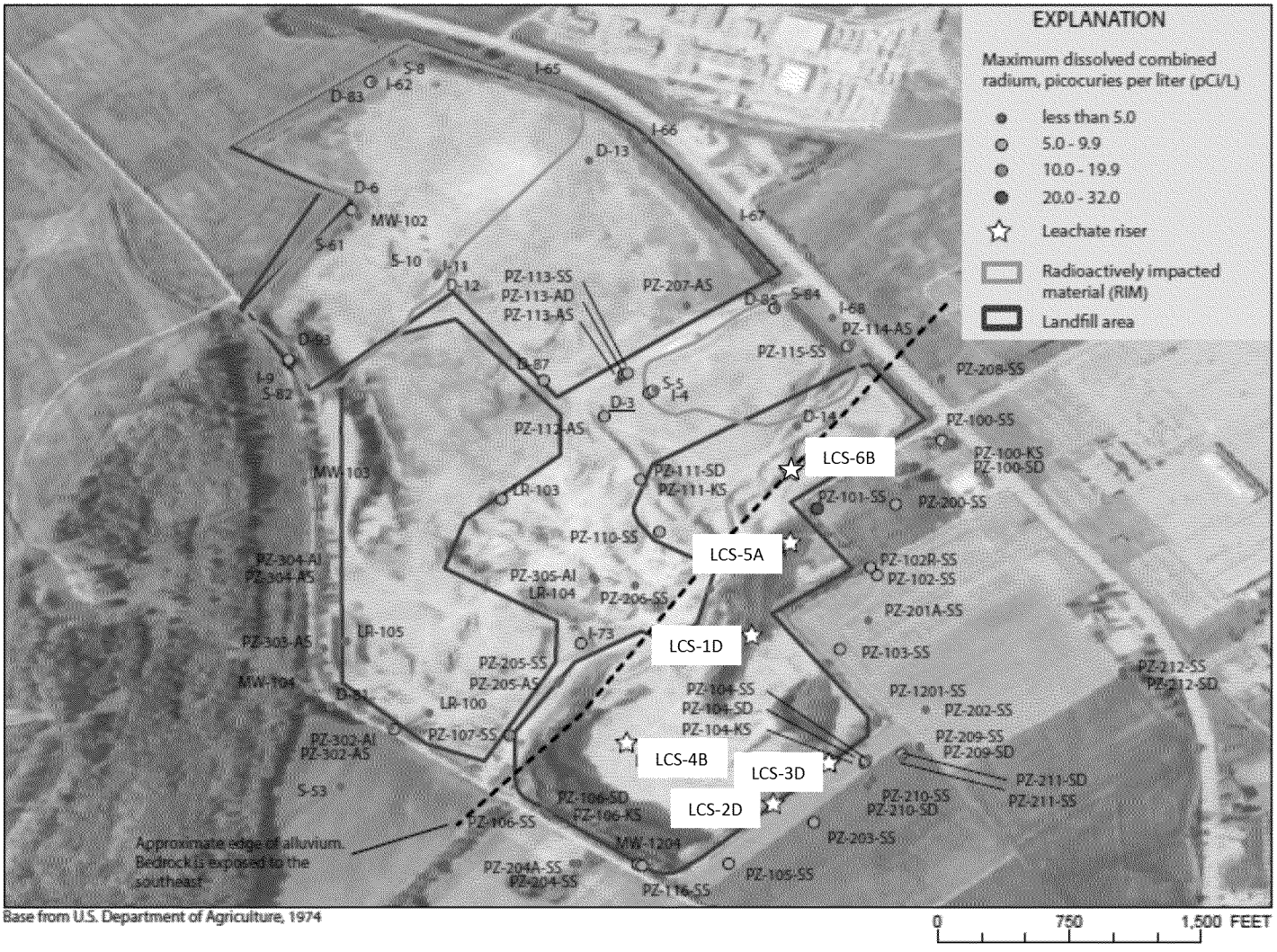

Figure 1. Location of Leachate Risers and Average Concentration of Dissolved Combined Radium in Groundwater Samples from West Lake Landfill site, 2012 to 2014 (adapted from Figure 13 of the December 2014 USGS Groundwater Report)

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Sampling of pretreated leachate loaded into trucks takes place at the truck loading station. Since pretreatment plant startup, leachate samples have been collected and reported to the MSD weekly. This will continue through May 2015, when sampling and reporting will transition to a monthly schedule through the end of the year. After 2015, sampling and reporting will be performed every three months. See Table 1 for leachate limits.

Any problem discharge from Bridgeton Landfill must be reported immediately to MSD. A problem discharge is any upset in the leachate pretreatment system, slug discharge (any discharge of a non-routine, episodic nature such as an accidental spill or a non-customary batch discharge), bypass of pretreatment, spill or accident that could send a prohibited substance into the MSD system or cause a violation of MSD's state water discharge permit.

Leachate Treatment and Disposal

The January 2015 Leachate Management Plan (Full Operation) for Bridgeton Landfill describes the pretreatment process as follows.

1. Untreated leachate is pumped into a 316,000-gallon tank where it is aerated to remove benzene and other volatile (easily evaporated) substances and the pH (acidity) is adjusted. See Figure 2.
2. Air from the tank goes through a thermal oxidizer (a flare) to destroy the benzene and other volatile substances.
3. The leachate is then pumped from the 316,000-gallon tank into the treatment building where it is treated to remove metals and solids.
4. From the treatment building, treated liquid is pumped into one of four one-million-gallon tanks for aeration and biological treatment to improve the quality of the wastewater sent to the MSD.
5. After biological treatment, the wastewater is filtered to remove solids and piped into a 96,000-gallon aboveground storage tank.
6. Wastewater approved for disposal is piped from the 96,000-gallon tank to one of the MSD wastewater treatment plants. Discharge is metered from the tank to a nearby lift station.

If needed, the leachate can also be hauled to an approved disposal facility by truck from a loading

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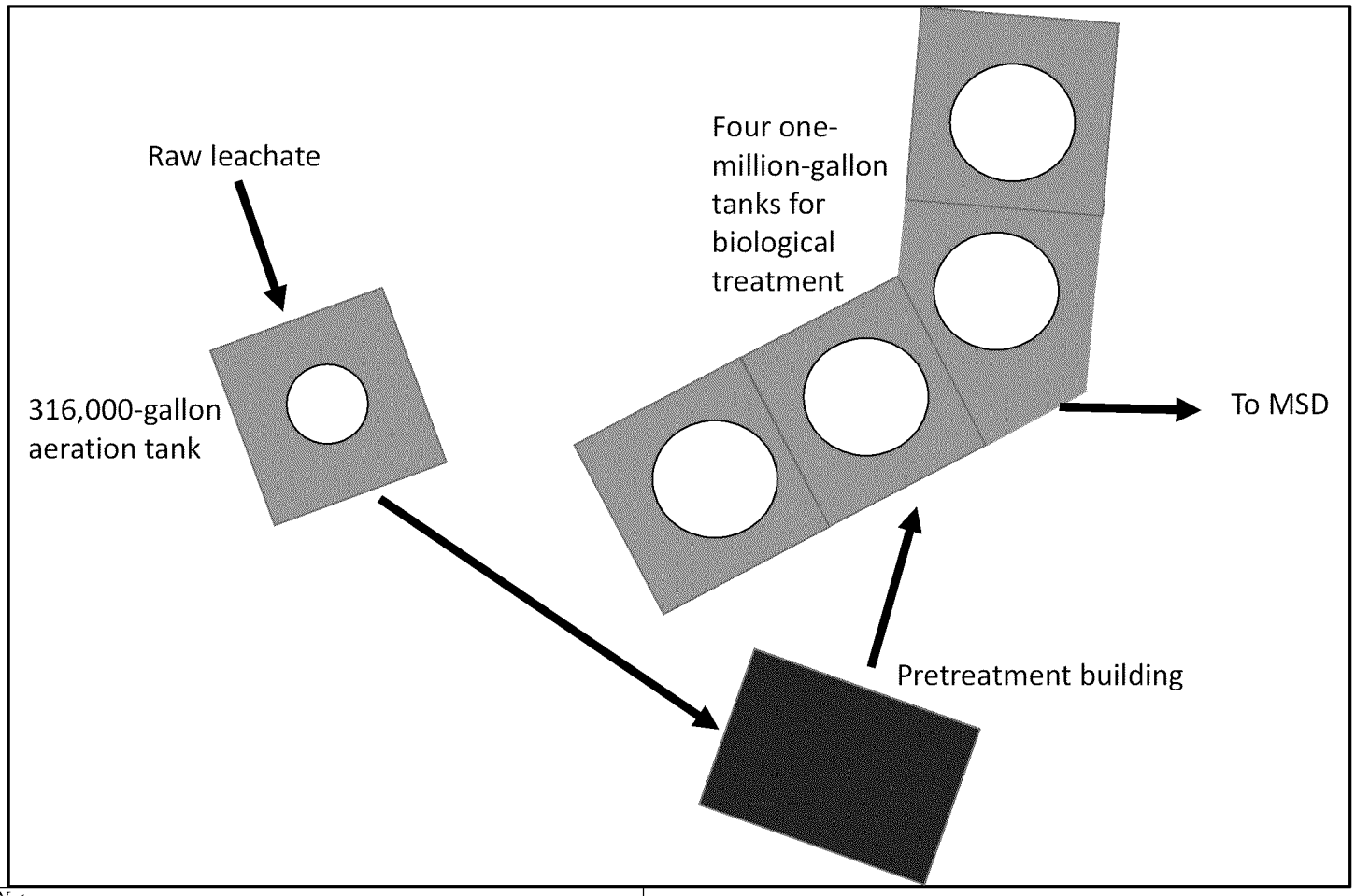

Figure 2. Illustration of Leachate Pretreatment Flow

Notes:

**** = reporting requirement only, no limit
mg/L = milligrams of substance per liter of leachate
pCi/L = picocuries of radiation per liter of leachate
> means greater than < means less than
[1]From: Metropolitan St. Louis Sewer District, Discharge Permit 1003803000-1

Missouri State Operating Permit (Missouri Clean Water Law)

Under its state permit from Missouri Department of Natural Resources (MDNR), Bridgeton Landfill may also discharge stormwater from five locations into a tributary of Fee Fee Creek. Discharged water must be sampled every three months during a stormwater runoff event. The water is tested for metals, benzene, ethylbenzene and other water quality parameters. Stormwater runoff is not tested for radionuclides.

The permit prohibits the discharge of leachate or leachate-contaminated stormwater into a receiving stream. The permit runs from April 2011 to April 2016. It was revised in June 2014.

For More Information:

Leachate Management

MSD website: http://www.stlmsd.com

Leachate Management Plan (Full Operation)
For a copy, request from CAG. (January 2015)

MSD Industrial Wastewater Discharge Permit for Bridgeton Landfill:
http://mediad.publicbroadcasting.net/p/kwmu/files/Bridgeton_Landfill_Permit_September_1_2014.pdf
(September 2014)

Stormwater Management

MDNR website: http://dnr.mo.gov/bridgeton

Stormwater Discharge Permit:
http://dnr.mo.gov/env/wpp/permits/issued/docs/0112771.pdf

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Allowable Radionuclide Discharge Limits to Sanitary Sewer Systems

There are no current federal regulations for disposal of radionuclides in sanitary sewers.[2] However, the Nuclear Regulatory Commission (NRC) sets allowable discharge limits for radionuclide releases to sanitary sewer systems for its licensees. MSD has voluntarily adopted these NRC discharge limits and specifically lists radium-226, radium-228 and uranium discharge limits in the Bridgeton Landfill discharge permit. Discharge limits for radionuclides into a sanitary sewer by an NRC licensee are listed in the Code of Federal Regulations, Title 10, Part 20, Appendix B, Table 3.

The NRC calculates the monthly average discharge limit for each radionuclide so that a "reference man" (a 154-pound man) would receive an annual effective dose equivalent of 0.5 rem (roentgen equivalent man) if the sewage released was the only source of water for that man during a year. Table 2 provides context for this value, listing effective radiation doses in the United States. NRC licensees that discharge water to a sanitary sewer must also meet other requirements.

The rem measurement is a measurement of dose equivalent or effective dose. This measurement combines the amount of radiation absorbed and the medical effects of that type of radiation.

Table 2: Effective Radiation Doses in the United States

Source	Dose Equivalent
U.S. average external background radiation	0.06 rem per year
Natural K-40 and other radioactivity in body	0.04 rem per year
Chest x-ray effective dose	0.01 rem per view
Radon in the home (variable)	0.2 rem per year
Source: Adapted from information provided by the Health Physics Society: http://hps.org/publicinformation/ate/faqs/radiation.html.	

Table 3 shows the allowable monthly average discharge concentrations for sanitary sewer systems as dictated by the NRC for radium-226, radium-228, thorium-230 and uranium. In response to public concerns, MSD began testing wastewater from Bridgeton Landfill for thorium-230 earlier this year. Bridgeton Landfill is not currently required to self-test for thorium-230, but the permit can be modified if needed.

Table 3: NRC Allowable Radionuclide Monthly Average Discharge Concentrations for Sanitary Sewers

Radionuclide	Monthly Average Concentration[a]	
	µCi/ml	pCi/L
Radium-226	0.0000006 (6E-7)	600
Radium-228	0.0000006 (6E-7)	600
Thorium-230	0.000001 (1E-6)	1,000
Uranium	0.000003 (3E-6)	3,000

Notes:
a. From the NRC, http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/appb/#U, accessed 6/3/2015.
Note: Copy and paste this link into your Web browser to see the list of radionuclides. Click on individual radionuclide names to see the monthly average concentration that can be released to a sanitary sewer.
µCi/ml = microcurie per milliliter
pCi/L = picocurie per liter

Conversion from µCi/ml to pCi/L

The NRC lists radionuclide discharge limits in units of microcuries per milliliter of water (µCi/ml). The unit used in other related TASC fact sheets is picocuries per liter of water (pCi/L). Table 3 includes both units. To convert from µCi/ml to pCi/L, multiply the µCi/ml value by 1,000,000,000 (1E9) to get to the value in pCi/L. This is because there are 1,000,000 picos in 1 micro and 1,000 milliliters in a liter.

For More Information

Code of Federal Regulations Part 20 – Standards for Protection Against Radiation: http://www.nrc.gov/reading-rm/doc-collections/cfr/part020

Appendix B to Part 20: http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/part020-appb.html (includes link to "List of Radionuclides" where values are found)

[2] http://cfpub.epa.gov/safewater/radionuclides/radionuclides.cfm?action=R

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